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EXAMINER

LAVARIAS, ARNEL C

ART UNIT	PAPER NUMBER
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2872

DATE MAILED: 10/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 10/721,128	Applicant(s) DIKE, BRUCE D.	
	Examiner Arnel C. Lavarias	Art Unit 2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 and 12-28 is/are pending in the application.
- 4a) Of the above claim(s) 3-5, 10, 16-25, 27 and 28 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1, 2 and 7 is/are allowed.
- 6) ☒ Claim(s) 6, 8, 9, 12-15 and 26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. The amendments to Claim 26 in the submission dated 8/25/06 are acknowledged and accepted.
2. The amendments to the specification and abstract of the disclosure in the submission dated 8/25/06 are acknowledged and accepted. In view of these amendments, the objections to the specification in Sections 8-9 of the Office Action dated 4/28/06 are respectfully withdrawn.

Response to Arguments

3. The Applicant's arguments filed 8/25/06 have been fully considered but they are not persuasive.
4. The Applicant argues that, with respect to newly amended Claim 26, as well as Claims 6, 13 which depend on Claim 26, Ferguson fails to teach or reasonably suggest the recited limitations of Claim 26. The Examiner respectfully disagrees. With regard to Applicant's argument that it is not clear whether enlarged image 34 is truly a real image, the Examiner notes that there is no doubt that enlarged image 34 is a real image, since Ferguson specifically discloses enlarged image 34 as being a real image (See for example Abstract; col. 7, lines 20-40). One cannot make a determination of whether an image is real or virtual only on the basis of whether that image is erect or inverted, as Applicant appears to contend.

5. Applicant further argues that Fergason fails to teach or reasonably suggest that a human viewer visually perceives the entirety of the real floating image when the viewer is properly positioned at a vantage point relative to the system, particularly since the optical system of Fergason is merely a variant of conventional 'forward' projection systems. The Examiner respectfully disagrees. Applicant has failed to appreciate that the optical systems of Fergason (See specifically Figures 1 and 3) utilize a *retro-reflector* (See 32 in Figures 1, 3), as opposed to a lens or curved mirror. As defined by Fergason, a retro-reflector reflects light substantially in the same, but opposite, direction as the direction that the light is incident on the retro-reflector (See col. 6, lines 27-31). Thus, the incident and reflected light rays to and from the retro-reflector are *conjugate*. This also means that the image (See 34 in Figure 1; 34' in Figure 3) directly at the output of the lens (See 30 in Figures 1, 3) is projected onto the retro-reflector, and relayed to a conjugate point (i.e. viewing location) in space (See 11 in Figures 1, 3; col. 7, line 12-col. 8, line 24). Thus, a viewer at the conjugate point or viewing location will be able to see the image. Further, Fergason notes that the entire image may be viewed at this position (See col. 8, line 47-col. 9, line 20). Applicant's discussion of conventional 'forward' projection systems does not appear to be of particular relevance in the operation of the optical systems of Fergason, since the discussion of conventional 'forward' projection systems does not include any mention of the use of conjugate optics.
6. The Applicant also argues that, with respect to newly amended Claim 26, as well as Claims 6, 8-9, 12-15 which depend on Claim 26, the combined teachings of Tanaka et al., Hoppe, and Phillips Electronics fail to teach or reasonably suggest that a human viewer

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visually perceives the entirety of the real floating image when the viewer is properly positioned at a vantage point relative to the system. After reviewing Tanaka et al., Hoppe, and Phillips Electronics, the Examiner agrees, and respectfully withdraws the rejections in Section 13 of the Office Action dated 4/28/06.

7. Claims 6, 8-9, 12-15, 26 are now rejected as follows.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

9. Claims 6, 8-9, 12-15, 26 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 26 recites the limitation ‘...that a human viewer visually perceives the entirety of the real floating image when the viewer is properly positioned at a vantage point relative to the system...’. Contrary to Applicant’s assertion (See specifically Pages 12-13 of Applicant’s response filed 8/25/06) that such a limitation is disclosed in, and even inherent to, the instant application and U.S. Patent 6262841 which has been incorporated by reference into the instant application, the Examiner disagrees. No mention is made in the specification of the instant application to make one of ordinary skill aware that a

human viewer will perceive the entirety of the real floating image. In particular, and as supported by Applicant's own arguments and exhibits, the ability for one to view an entire real image from an optical projection system is highly dependent on size of the image, distance from the image to the viewer, optical element characteristics (e.g. focal lengths, sizes, refractive indices), and even light throughput. None of these variables have been provided for or determined in the instant application, and one of ordinary skill would have no choice but to perform undue experimentation to determine the appropriate, or set of appropriate, values for these variables. At best, some portion of the real image will be viewable by the viewer, based on the generic viewing position disclosed in the instant application. In addition, Applicant should be aware that since the drawings of the instant application are silent with respect to dimensions and whether they are to scale, arguments referring to such are of little value. See MPEP 2125. Claims 6, 8-9, 12-15 are dependent on Claim 26, and hence inherit the deficiencies of Claim 26.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 6, 13, 26, as best understood, are rejected under 35 U.S.C. 102(b) as being anticipated by Ferguson (U.S. Patent No. 5572363), of record.

Ferguson discloses a system (See for example Figures 1, 3) for projecting a real floating image into free space (See for example 34', 11 in Figure 3; col. 7, lines 20-40), comprising at least one image source (See 20 in Figures 1, 3) operatively configured to provide a source image (See 33 in Figure 1; 33' in Figure 3); and an optical system (See for example 30, 32, 71, 31' in Figure 3) located a distance from the source image, the optical system comprising at least one converging element (See for example 30 in Figure 3), and a broadband reflector-polarizer (See 31' in Figure 3; col. 10, line 66-col. 11, line 12; col. 11, lines 41-62); the converging element being operatively configured, and the distance being selected, so that, when the at least one image source provide the source image, the optical system forms a real floating image of the source image in free space (See 33', 34', 11 in Figure 3) such that a human viewer (See 13 in Figure 3) visually perceives the entirety of the real floating image when the viewer is properly positioned at a vantage point (See 11 in Figure 3) relative to the system (See col. 8, line 47-col. 9, line 20). Ferguson further discloses a beamsplitter (See 31' in Figure 3) located in the optical path between the source and the real image when the system is in use; and the broadband reflector-polarizer comprises a cholesteric liquid crystal structure (See 31' in Figure 3; col. 10, line 66-col. 11, line 12).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 6, 8-9, 12-15, and 26, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (U.S. Patent No. 5853240), of record, in view of Hoppe (U.S. Patent No. 5715023), of record, alone, or at least further in view of Phillips Electronics (EP0606940 A2), of record.

Referring to the discussion of Figures 8-9, Tanaka et al. discloses a system for projecting a real floating image into free space, the system comprising at least one image source (3c) operatively configured to provide a source image; and an optical system (40c) located a distance from said source image, the optical system comprising: at least one converging element (41c); and a cholesteric reflector-polarizer (13c); said converging element being operative configured, and the distance being selected so that, when said at least one image source provides said source image, said optical system forms a real floating image of said image source in free space, *such that a projection screen can be located at the location of the floating image to reflect the real image to an observer.*

Thus, Tanaka et al. discloses the invention substantially as claimed. However, Tanaka et al. does not disclose the reflector-polarizer as a 'broadband' reflector-polarizer, and that a human viewer visually perceives the entirety of the real floating image when the viewer is properly positioned at a vantage point relative to the system, as recited.

In the same field of endeavor (It is noted that Tanaka et al. additionally teaches that their optical system (40c) is equally useful in a *virtual* image display arrangement, as discussed in connection with Figure 17, atop col. 13. Thus, the two disclosures are in the same field of endeavor.), Hoppe discloses an optical system comprising a converging

element and cholesteric reflector-polarizer. Hoppe teaches that the display can be modified to provide a multicolored or broadband image by stacking cholesteric layers in the reflector-polarizer (See for example Figure 2).

It would have been obvious to one of ordinary skill to stack a plurality of cholesteric layers in the reflector-polarizer (13c) of Tanaka et al., in the interest of providing a multicolored or broadband image, as suggest by Hoppe. One of ordinary skill would have appreciated that the provision of a full-colored display would have offered greater marketability through greater consumer acceptance. The Examiner believes that the stacked cholesteric layers, providing the 'wider bandwidth' operation suggest by Hoppe (col. 6, lines 3-5) fairly qualifies as a 'broadband' reflector-polarizer. However, if such is not the case, then the following applies.

In the same field of endeavor, Phillips Electronics teaches that prior art broadband 'polarizers' obtained by serially stacking a plurality of cholesteric layers having different band-pass characteristics suffer from several drawbacks including disclinations, loss of planar molecular order, and angular dependence stemming from requisite large thicknesses. In order to overcome these issues, Phillips Electronics teach that a single cholesteric layer can be provided with a variable pitch so as to provide a broadband polarizing characteristic.

In practicing the invention of Tanaka et al., it would have been obvious to one of ordinary skill to employ a variable-pitch, broadband cholesteric layer in place of the multi-layered reflector-polarizer as suggested by Hoppe, in the interest of providing a

reflector-polarizer that overcomes the drawbacks associated with serially-stacked cholesteric layers, as taught by Phillips Electronics.

The combined teachings of Tanaka et al., Hoppe, and Phillips Electronics do not explicitly disclose that a human viewer visually perceives the entirety of the real floating image when the viewer is properly positioned at a vantage point relative to the system. However, it would have been readily evident to one of ordinary skill to move closer or further away from the projection optical system so as to be able to visually perceive the entirety of the real floating image generated by the projection optical system. This is akin to a movie-goer sitting near the back of a movie theater so as to be able to see the entire screen. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have a human viewer visually perceive the entirety of the real floating image when the viewer is properly positioned at a vantage point relative to the system, in the system of Tanaka et al., Hoppe, and Phillips Electronics, so that the viewer does not miss important or critical projected information or images from the real image during viewing.

With regard to Claims 6 and 8, the converging element comprises a beam splitter (half mirror coat) on the convex surface thereof so that the beam splitter is located between the source and the real image.

With particular regard to Claim 9, Tanaka et al. suggest integrating the polarizer-reflector (13c) on the plano surface of the converging element (41c) (col. 10, lines 52-59). In such an embodiment, the converging element would “comprise” the broadband reflector-polarizer.

With particular regard to Claim 12, the at least one converging element may be considered as being the concave reflector defined by the half mirror coating on the surface of lens 41c.

With regard to Claims 14 and 15, Phillips Electronics teach that cholesteric polarizers can be operated in a recirculating configuration wherein theoretically, nearly 100% of the incident light ultimately becomes polarized (Page 2, lines 14-26). One of ordinary skill would have recognized this as corresponding to a transmissive/reflective efficiency of nearly 100%. It is clear however, that the actual efficiency would depend upon the operating bandwidth of the cholesteric polarizer with respect to the light source. Thus, it is believed that the broadband polarizer suggested by Hoppe would have had at least the recited 60% efficiency. However, Phillips Electronics further teach that the prior art stacked cholesteric layers having different band-pass characteristics suffer from several drawbacks including disclinations, loss of planar molecular order, and angular dependence stemming from requisite large thicknesses. In order to overcome these limitations, Phillips Electronics teach that a single cholesteric layer can be provided with a variable pitch so as to provide a broadband polarizing characteristic. The examples of Phillips Electronics are operative over substantially the entire visible wavelength region. Thus, it is believed that one of ordinary skill would have arrived at 90% efficiency, at least in view of the teachings of Phillips Electronics.

Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arnel C. Lavarias whose telephone number is 571-272-2315. The examiner can normally be reached on M-F 9:30 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Arnel C. Lavarias
Primary Examiner
Group Art Unit 2872
10/20/06